NOTES ON STRYMON CARYAEVORUS McDUNNOUGH (LEPIDOPTERA, LYCAENIDAE)

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Ever since its recognition and naming (McDunnough, 1942) *Strymon caryaevorus* has remained little known and less understood. The original specimens were reared from larvae from Merivale, Ontario (the type locality) and Aylmer, Quebec. Since the larvae were not recognized as something new or important, no detailed information was recorded about them or the pupae. The original description stated merely that "the hickory feeders were more evenly pale green without much trace of darker dorsal or lateral markings," the comparison being with larvae of *S. falacer* (Godart). The implication was also made that the larvae of *S. falacer* feed only on oak, those of *S. caryaevorus* on hickory (*Carya*). The distinctiveness of the male genitalia was mentioned but not described.

In 1942 Michener and dos Passos corrected the implication that *S. falacer* is not a hickory feeder, and also mentioned the "rather constantly smaller stigma of [the male] *caryaevorus.*" In both of these matters they were correct. They recorded specimens of *caryaevorus* in the American Museum collection from Jefferson Lake, Lesueur Co., Minnesota, and Johnstown, New York, and figured the male genitalia.

In 1950 Clench recorded the capture in Michigan of adult *caryaevorus* flying in company with *falacer,* visiting various flowers (*Daucus carota* and *Asclepias* sp.) and resting on leaves. To anticipate, in 1958 Clench recorded *caryaevorus* from the Powdermill Nature Reserve in western Pennsylvania.

In 1951 Klots briefly characterized *caryaevorus* and distinguished it from other eastern North American *Strymon,* figuring an adult male and summarizing what was known about the species.

In 1952 Klots and Clench, in naming *Strymon kingi* and discussing its genitalic characteristics, briefly described the distinctive features of the male and female genitalia of *caryaevorus.*

LIFE HISTORY NOTES

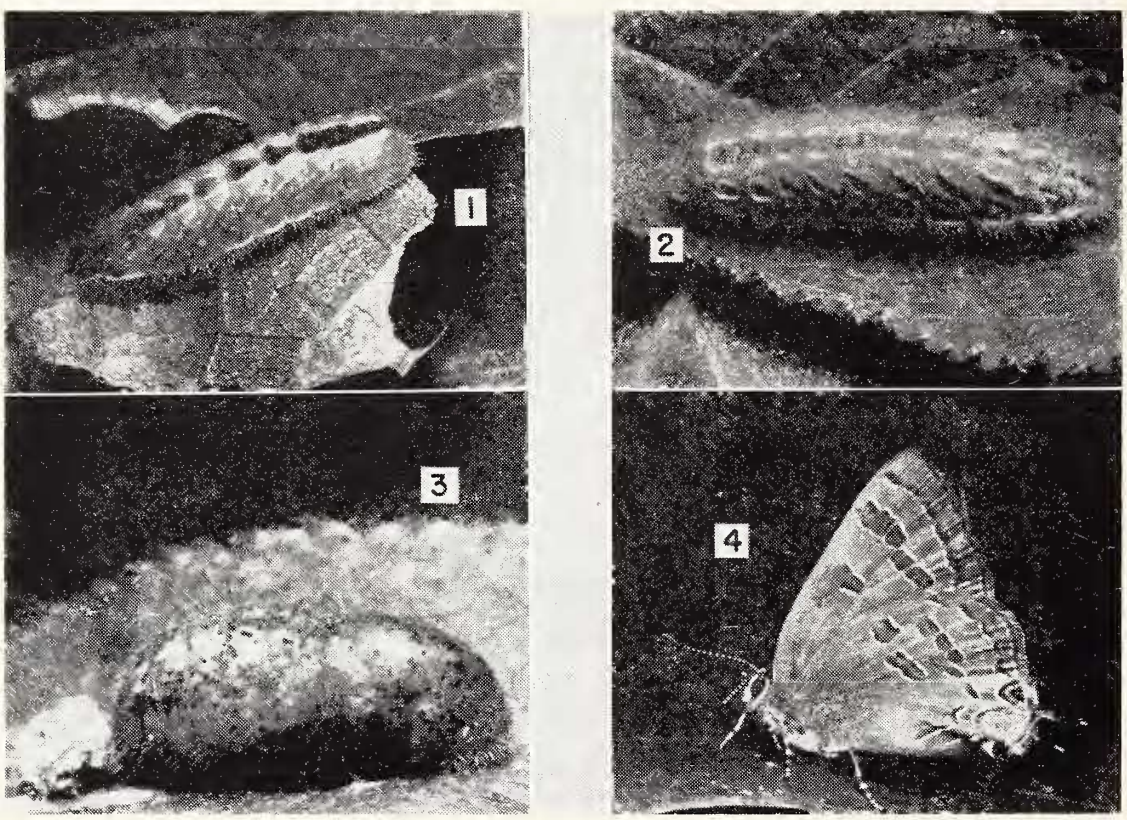
On 31 May 1959, at the Fairchild Botanic Garden of the Audubon Society Nature Sanctuary near Greenwich, Fairfield Co., Connecticut, during a New York Entomological Society field trip, the writer found five *Strymon* larvae. These were on a small hickory about five feet high that was identified as *Carya glabra* (Mill.) Spach. by Mr. Lester Bradley, the Audubon Society botanist. One larva was in bad condition, appearing to have been punctured or parasitized (perhaps the victim of cannibalism) and soon died. The other four were successfully reared through, pupating 7 June (♂ no. 1), 7 June (♂ no. 2), 6 June (♀ no. 1) and 7 June (♀ no. 2); and emerging from the pupae 14 June (♂ no. 1), 15 June (♂ no. 2), 13 June (♀ no. 1) and 14 June (♀ no. 2). The genitalia of all have been checked, so that their identification as *caryaevorus* is certain. Fortunately the larvae were recognized as distinctive, so that descriptions and color photographs were made of them and the pupae. The larval description that follows is something of a composite of all four specimens; but they showed extremely little variation. Very likely they were siblings.

LAST INSTAR LARVA (fig. 2). Head green; clypeus, labrum, a small patch surrounded by the ocelli, and mouthparts, brown. (In Scudder's key to *Thecla* (i.e. *Strymon*) larvae (Scudder, 1889, p. 874) these larvae would run on the head coloration to *calanus* (i.e. *falacer*). Prothorax green with vague, faint darker and lighter markings, the "bald patch" concolorous. General ground color of thorax and abdomen yellowish-green. From anterior edge of mesothorax to end of abdomen a broad, dark green, mid-dorsal line, with little change in width throughout its length, through which the "heart" shows plainly. On either side of this a whitish, sub-dorsal line, half as wide. On mesothorax, metathorax and abdominal segments 1–6, markings on each side going laterad and ventrad, as follows: laterad of the whitish sub-dorsal line a narrower, yellow-green line; then a whitish-green line which, near the posterior edge of each segment, bends and slants ventrad to the edge of the segment, and is much thicker just posterior to the middle of each segment; then a prominent, dark green, diagonal line; then a greenish-white diagonal line (especially prominent on meso- and metathorax) narrowing toward the posterior edge of each segment; then a dark green diagonal line, not quite reaching the posterior edge of the segment because the greenish-white line above it runs down there; then an indistinct, more yellowish-green line, scarcely diagonal, in which are the whitish spiracles; below this a narrow, darker green, longitudinal line; below this, along the lateral edge of the body, a light line that is yellowish on the anterior segments and becomes broader and whitish posterad. This light

lateral line continues posterad and runs almost around the posterior edge of the abdomen. Below it the ventral surface, leg bases and prolegs are dark green. The honey gland opening is plainly visible as a dark, transverse slit on abdominal segment 7. No papillae or other special structures were seen associated with the honey gland opening.

When found, one of the larvae was in a slight, irregular, silken web that loosely bound together a couple of leaflets; but this may have been only incidental, and the web the product of a pyralid larva that was common on the same plant. In captivity the larvae fed chiefly on the lower surfaces of leaves. When found they were feeding on small, very immature leaves; but these were the only leaves available at that time, and they showed no such preference later in captivity. The pupae were formed attached to leaf surfaces by both a posterior silk pad and a slight girdle.

The most outstanding differences between this larva and that



1. Mature larva, *Strymon falacer* (Godart); anterior end to right. Fairchild Botanical Garden, Greenwich, Conn., 18 May 1957.

2. Mature larva, *Strymon caryaevorus* McDunnough; anterior end to left. Fairchild Botanical Garden, Greenwich, Conn., 2 June 1959.

3. Pupa, *Strymon caryaevorus,* the same individual as the larva of Fig. 2.

4. Adult male, *Strymon caryaevorus,* the same individual as the larva and pupa of Figs. 2 and 3.

The photographs of *S. caryaevorus* are not equally magnified.

of *S. falacer* concern the mid-dorsal space and the sub-dorsal lines bordering it, and the lateral diagonal markings. In *falacer* (Fig. 1) the sub-dorsal lines tend to diverge strongly from each other toward the posterior edge of each segment, so that the mid-dorsal space tends to be a series of isosceles trapezoids with their broader bases posterad; while in *caryaevorus* the mid-dorsal space tends to be relatively parallel-sided, even in width and continuous throughout its entire length. In some *falacer* larvae the mid-dorsal trapezoids are all filled in with brownish, as in the specimen figured; but in others only one or more of the anterior and of the posterior ones are thus dark, the middle ones being concolorous green. The writer has seen only one (of some fifteen) *falacer* larvae that had no dark mid-dorsal spots.

The diagonal lateral markings of *caryaevorus* are more prominent than those of *falacer,* particularly the diagonal dark green lines about midway between the sub-dorsal line and the lateral edge; and, especially on the meso- and metathorax, the greenish-white diagonal lines laterad of these. Critical comparisons of many more larvae of various genetic strains and from other localities will eventually have to be made. It may be noted that in McDunnough's original characterization the *caryaevorus* larvae were mentioned as lacking dark dorsal and lateral markings as compared with those of *falacer.*

The pupae of even the commonest species of *Strymon* are so poorly known in detail that the writer hesitates to attempt to characterize those of *caryaevorus.* The four pupal and last larval exuvia are preserved for future reference in the collection of the American Museum. In Scudder's very incomplete key (*l.c.*, p. 874) they would run to "*calanus*" (e.g. *falacer*), having relatively short body hairs, and at least many tiny, wart-like elevations at the junctions of the raised ridges that form a fine network on the body.

ADULT CHARACTERIZATION

Because of individual variation (chiefly of *falacer*) it is not always possible, for the writer at least, to feel sure of identifications of adult *caryaevorus* by color and pattern. In this connection 54 *caryaevorus* and more than 400 *falacer* were studied; all of the *caryaevorus,* and all of the *falacer* about which there was any doubt, were checked by genitalic examination. The char-

acters discussed below should serve for the distinction of 80 to 90 percent of all specimens of both species; but all about which there is the least doubt should be checked by the genitalia, which offer completely reliable diagnostic characters.

On the dorsal surface of the wings the stigma at the end of the discal cell of the male is slightly more slender and distally tapering in *caryaevorus;* in *falacer* its distal end is more broadly rounded.

On the ventral surface of the wings (Fig. 4) are a number of important characters. In *caryaevorus* the spots of the postmedian row are wider (at least costad), better developed, and form a more broken and "offset" line than in *falacer.* Occasional aberrant *falacer,* however, show much widening and irregularity in this line. In *caryaevorus* the three most costad large spots, in cells R_5 M_1 and M_2 (there is a trace of a still more costad spot in cell R_4) are usually much wider than the succeeding ones toward the inner margin. These three spots form one group; the two in cells M_3 and Cu_1 form another group; and finally the two fused spots in cell Cu_2 (+1A) form a third group. In *caryaevorus* these groups tends to be offset, breaking the smooth continuity of the row: the lower spot of the first group is often displaced half or more its width marginad than the upper one of the second group; and the lower spot of the second group is similarly displaced more marginad than the fused spot below it. In *falacer* this row is usually much more even in width and less broken and offset. In *caryaevorus* the basad white borders of these spots are more often present, and the spots often contain a very faint, central shade of a slightly more orange brown. The submarginal spots of the fore wing tend to be slightly more prominent in *caryaevorus,* sometimes even showing a faint trace of a light distal edge.

On the hind wing of *caryaevorus* the most costad of the postmedian row of spots tends to have its basal and distal edges curved, concave distally; and to occupy an almost median position between the base and margin of the wing. In *falacer* this spot tends strongly to have straighter basal and distal edges and to lie relatively more toward the outer margin, so that it seldom overlaps the double discocellular spot below it. The large, blue patch in cell Cu_2 tends to be relatively longer baso-distally in *caryaevorus,* a feature that is especially noticeable in its relation to the continguous, orange and black spot in cell Cu_1, which tends

to be smaller baso-distally. In *caryaevorus* the white inner edge of the blue spot usually touches vein Cu_2 considerably basad of the point where the white inner edge of the orange and black spot touches the same vein; while in *falacer* the white inner edges of the two spots may touch vein Cu_2 at almost the same point, that of the blue spot seldom being more than two or three scale-rows more basad. This very useful distinguishing character was pointed out to me by Gordon Small Jr., after his study of the very fine series of *caryaevorus* taken by him at Riverside, Connecticut (see below).

It must be stressed again that, because of the considerable amount of individual variation in *caryaevorus* and *falacer,* particularly in the latter, none of the pattern characters is as completely trustworthy as those of the genitalia.

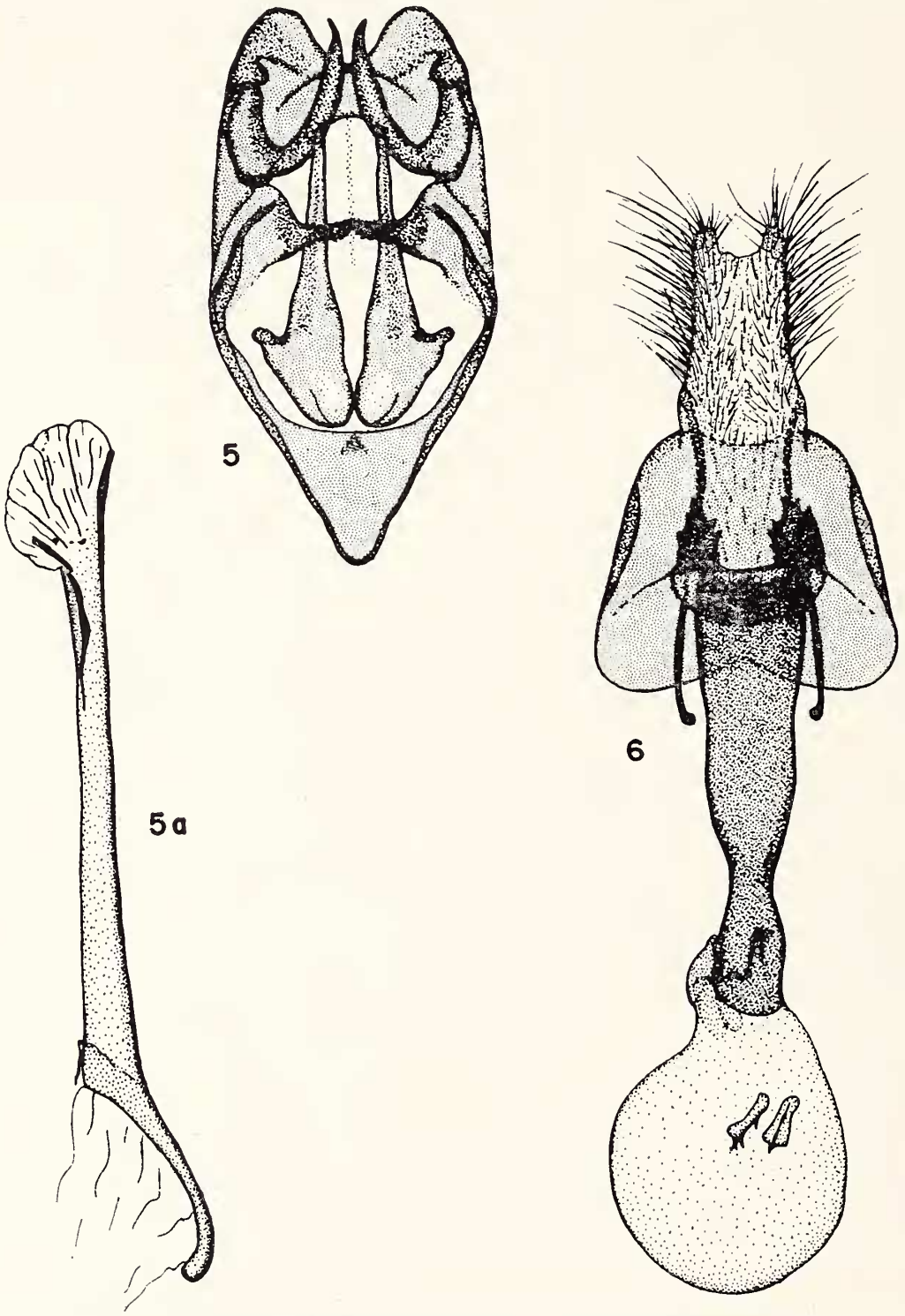
GENITALIC CHARACTERS

Fortunately there are easily seen and completely reliable characters for distinguishing *caryaevorus* and *falacer* in both the male and female genitalia. The female genitalia can be distinguished without dissection by merely brushing away the vestiture at the end of the abdomen. The most distinctive character of the male genitalia can be seen on most specimens only on dissection; but it is rendered plainly visible if the genitalia of a fresh specimen are gently grasped with fine-pointed forceps and pulled outward so as to be mostly visible. Carefully done, this harms the specimen not at all, and is a procedure that enables quick, positive identification of many hairstreaks.

The most distinctive feature of the *caryaevorus* male genitalia (fig. 5 and 5a) is the possession of a pair of prominent, small-spined, processes that project mesad from the ventro-caudal angles of the tegumen, lying ventro-caudad of the valvae and aedeagus and meeting in the mid line or overlapping. In *falacer* there are only slight rudiments of these processes. They are well developed, but not as large as in *caryaevorus,* in *Strymon liparops* (Boisduval & Leconte). In comparison with *falacer, caryaevorus* has the arms of the gnathos ('falces'') somewhat stouter, the valvae more slender and the saccus narrower and more tapering.

The most distinctive feature of the *caryaevorus* female genitalia (fig. 6) is the possession of a flat, heavily sclerotized, prominently projecting, toothed process on either side of the ostium bursae. Sometimes these are merely simply pointed; but usually

they bear several teeth. There is nothing at all like this in *falacer,* which has merely a simple, slightly projecting, curved ridge (lamella postvaginalis) at the caudal edge of the ostium. In addition, in comparison with *falacer, caryaevorus* appears to



5. Male genitalia, *Strymon caryaevorus,* ventro-caudal aspect, aedeagus removed. Jefferson Lake, Lesueur Co., Minn., 14 July 1915.

5a. Aedeagus of same, lateral aspect.

6. Female genitalia, *Strymon caryaevorus,* ventral aspect. Greenwich, Conn., reared on *Carya glabra,* ex pupa 13 June 1959.

have the papillae anales slightly more slender, the ductus bursae a little stouter, and a more heavily sclerotized, complex cervix bursae that bends strongly dorsad so as to make the corpus bursae lie far in the dorsal part of the abdomen. It is worth noting that the male genitalia, while giving no very definite evidence, are in general more like those of *falacer* (and *edwardsii* (Saunders)) than of any other Eastern *Strymon*. Although the spinous processes of the tegumen might indicate a relationship to *liparops*, the writer feels that they probably arose independently. The female genitalia, in the proportions of the ductus bursae and the structures of the cervix bursae, seem to indicate a fairly close relationship to *falacer* (and *edwardsii*).

GEOGRAPHIC RANGE

S. caryaevorus is known from several localities in central and eastern Ontario and Quebec, Vermont, Minnesota, Michigan, Pennsylvania, New York, Connecticut, New Jersey and Kentucky. Its distribution seems largely to coincide with that of the biotic formation variously known as the Great Lakes forest; the Great Lakes-St. Lawrence region; the Upper Transition Zone; or as an ecotone between the deciduous and the boreal, needle-sclerophyll forests. It would be interesting to know if it occurs in the more or less isolated area of this formation between the western end of Lake Superior and Lake of the Woods. The records in the New York City–Connecticut region and southward are somewhat more to the south of this biotic formation, being in what is essentially an ecotone between the northern deciduous forest and the Mississippi Valley or the coastal plain. The writer has seen but one New Jersey specimen, a female from Newton, Sussex Co., 27 June, 1959, leg. Gordon Small, Jr. This specimen was taken in an "old field" environment where a colony of *Lephelisca borealis* (Grote & Robinson) also occurred. About eighty other New Jersey specimens examined were all *falacer*. Two specimens from Mt. Vernon, Rockcastle Co., Kentucky, 13 June, 1959, leg. L. J. Sanford, have been checked by genitalia; so has one from near Mt. Equinox, Vermont, 5–6 July 1959, leg. C. F. dos Passos. The writer has heard of records from Maryand, Ohio and Indiana which there is no reason to doubt, but has not seen the specimens.

In June, 1959, Gordon Small Jr., collected over 30 specimens of *caryaevorus* at Riverside, Fairfield Co., Connecticut, only a few

miles from Greenwich. The writer has checked the genitalia of about a dozen of these, confirming Mr. Small's identification of them. The coincidence of the simultaneous discovery of the species in 1959 in southern Connecticut and New Jersey led at first to the belief that *caryaevorus* had made a sudden, great extension of its range southward. However, the recognition of a hitherto misidentified specimen of *caryaevorus* in the American Museum collection from Yonkers, New York, July, 1934 (ironically, collected by the writer) shows that *caryaevorus* has been in the New York City region for a long time, and that 1959 was merely an unusually good year for it (and for collectors). Yet, such extremely thorough local collectors as Cook, Watson, W. P. Comstock and Buchholz never found it! It is certainly very "local," occurring in small, probably widely separated colonies. Collectors will do well to keep this in mind, and never to take for granted that *caryaevorus* does not occur in any suitable locality where *Carya* grows.

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